WBS	Description	% Comp	PPP	Cycle Time	PM's In	Tgt Pos	Horn ON	Duration	Start	Lead Person	Notes
7.1	MI & NuMI set up	0%		0	No	Out	No	3.5 d	Dec-04		NuMI single batch setup. Ramp timing, Autotune validation
7.1.1	Load BPS commissioning file	0%	0	0	No	Out	No	1 d	Dec-04	Bruce Baller	First BPS commissioning file has large magnet current windows, std loss monitor windows, mask off kicker magnet status, mask off corrector magnets, target OUT, intensity <5E11.
7.1.2	Disable NuMI kicker & enable NuMI permit	0%	0	0	No	Out	No	1 h	Dec-04	Sam Childress	
7.1.3	Start $23 cycle every 2 minutes. 2 turns, 30 bunches	0%	0	120	No	Out	No	1 h	Dec-04	Alberto Marchionni	Need 2 booster turns & 30 bunches to get 3E11 ppp so MI BPM's work
7.1.4	Ramp NuMI magnets. Check timing & levels	0%	0	120	No	Out	No	3 h	Dec-04	Sam Childress	All correctors are turned off. Magnet current readback is manually checked against design settings.
7.1.5	Put Profile Monitors IN	0%	0	120	Yes	Out	No	1 h	Dec-04	Sam Childress	
7.1.6	Start Autotune & check magnet readbacks	0%	0	120	Yes	Out	No	2 h	Dec-04	Peter Lucas	Autotune is run in "do-nothing" mode to confirm that it is properly reading magnets and instrumentation. Autotune is set to ignore corrector magnets and to use profile monitor mean positions as inputs.
7.1.7	Check readback status of all NuMI devices	0%	0	120	Yes	Out	No	2 h	Dec-04	Sam Childress	All devices are checked on the parameter pages to ensure that readback status is correct. Ensure that the target is OUT.
7.1.8	Ensure Alarms & Limits, BLBM, BBM running	0%	0	120	Yes	Out	No	1 h	Dec-04	Bruce Baller	Ensure that all required administrative applications are running.
7.1.9	Ensure data-logging is on	0%	0	120	Yes	Out	No	1 h	Dec-04	Sam Childress	Ensure that we are data-logging MI & NuMI devices.
7.1.10	Ensure MI beam quality is acceptable	0%	0	120	Yes	Out	No	1 d	Dec-04	Alberto Marchionni	The MI orbit is checked to ensure the position is correct near the extraction region.
7.2	First beam to NuMI	0%		120	Yes	Out	No	2.25 d	Dec-04		Beam tuning to observe beam profiles tohadron monitor
7.2.1	Enable NuMI kicker	0%	3E11	120	Yes	Out	No	1 h	Dec-04	Bruce Baller	Beam is transported into the NuMI line when the kicker is turned on.
7.2.2	Tune beam from MI to hadron absorber	0%	3E11	120	Yes	Out	No	1 d	Dec-04	Sam Childress	Beam trajectory observed in PM's and BPM's. Adjustments to dipole magnets are made using Autotune in sem-automatic mode. Beam profiles are observed through pre-tgt and a 1 pad profile is observed on the had mon. Check to ensure expected pad is hit & co...

7.2.3	Check losses w PM's in	0%	3E11	120	Yes	Out	No	1 h	Dec-04	Sam Childress	Loss monitors readbacks are sampled as a reference.
7.2.4	Compare losses w PM's out	0%	3E11	120	No	Out	No	1 h	Dec-04	Sam Childress	Check that a drop is seen in all LM's when the PM's are moved out.
7.2.5	PM's put back in	0%	3E11	120	Yes	Out	No	1 h	Dec-04	Sam Childress	PM's are put back in.
7.2.6	Check BPM calibration	0%	3E11	120	Yes	Out	No	3 h	Dec-04	Sam Childress	BPM calibration is checked against the PM's.
7.2.7	Check calibration @ 3E11 ppp	0%	3E11	0	No	Out	No	3 h	Dec-04	Sam Childress	Intensity as measured by the BPM's, toroids, PM's and hadron monitor(?) are calibrated using the MI DCCT.
7.3	Aperture Scans	0%	3E11	60	Yes	Out	No	4 d	Jan-05		Check transport apertures & transport matrix
7.3.1	Scan the Lambertson apertures	0%	3E11	60	Yes	Out	No	1 d	Jan-05	Sam Childress	The MI/NuMI extraction 4 bump is scanned to confirm MI/NuMI losses are minimized. Adjust the NuMI transport if necessary.
7.3.2	Scan NuMI apertures	0%	3E11	60	Yes	Out	No	1 d	Jan-05	Sam Childress	Q113 and V118 are scanned using Auto-tune to check magnet apertures.
7.3.3	Declare beam transport standard	0%	3E11	60	No	Out	No	1 d	Jan-05	Sam Childress	Settings of major dipoles and quads are documented and declared "standard".
7.3.4	Define BPS Golden file	0%	3E11	60	No	Out	No	0 d	Jan-05	Bruce Baller	Standard beam transport magnet current settings define a new golden BPS file.
7.3.5	Validate Auto-tune operation	0%	3E11	60	No	Out	No	1 d	Jan-05	Peter Lucas	Check the transport matrix and validate Auto-tune operation
7.3.6	Start tuning with correctors	0%	3E11	60	No	Out	No	0 d	Jan-05	Sam Childress	Correctors are now used for tuning.
7.4	Horn Alignment	0%	3E11	60	Yes	Out	No	2 d	Jan-05		Check horn alignment with beam scan & tgt pit LM
7.4.1	Check horn 1 neck vert & hor alignment	0%	3E11	60	Yes	Out	No	1 d	Jan-05	Jim Hylen	The beam is moved horizontally and vertically while losses in the tgt pit PM are monitored to check the horn 1 alignment.
7.4.2	Check position monitor response (concurrent)	0%	3E11	60	Yes	Out	No	0.5 d	Jan-05	Sam Childress,Debbie Harris	Response of the BPM's, PM's and hadron monitor are compared while horn scans are in progress.
7.4.3	Check horn 1 DS end alignment	0%	3E11	60	Yes	Out	No	4 h	Jan-05	Jim Hylen	The position of the downstream end of horn 1 is checked by hitting the cross-hair wire and monitoring the tgt pit LM.
7.4.4	Check horn 2 US & DS end alignment	0%	3E11	60	Yes	Out	No	4 h	Jan-05	Jim Hylen	The position of the up/downstream ends of horn 2 are checked by hitting the cross-hair wire and monitoring the tgt pit LM.
7.5	Target/Baffle Alignment	0%	3E11	60	Yes	In	No	2 d	Jan-05		Check target/baffle alignment with beam scan & tgt pit LM

7.5.1	Scan target in ME position	0%	3E11	60	Yes	ME	No	1 d	Jan-05	Jim Hylen	Target is put in ME position and scanned horizontally and vertically. Baffle is OUT. Budal monitor and tgt pit PM response is checked. Beam position is held stable during this period.
7.5.2	Correlate Had Mon response w tgt position (concurrent)	0%	3E11	60	Yes	ME	No	1 d	Jan-05	Sacha Kopp	Hadron monitor profile behavior is monitored while target scan is in progress.
7.5.3	Scan target in LE position	0%	3E11	60	Yes	LE	No	4 h	Jan-05	Jim Hylen	Target is put in LE position. The beam is scanned horizontally and vertically to confirm alignment.
7.5.4	Correlate Had Mon response w tgt position (concurrent)	0%	3E11	60	Yes	LE	No	4 h	Jan-05	Sacha Kopp	
7.5.5	Scan target in HE position	0%	3E11	60	Yes	HE	No	4 h	Jan-05	Jim Hylen	Target is put in HE position and scanned horizontally and vertically to confirm alignment.
7.5.6	Correlate Had Mon response w tgt position (concurrent)	0%	3E11	60	Yes	HE	No	4 h	Jan-05	Sacha Kopp	
7.6	Raise intensity & check calibration	0%	1E12	120	No	Out	No	0.88 d	Jan-05		Check linearity of instrumentation, loss monitors
7.6.1	Authorize operation at 1E12	0%	3E11	120	No	Out	No	0 d	Jan-05	Bruce Baller	Modify Running Conditions if necessary
7.6.2	Increase intensity to 1E12 ppp	0%	1E12	120	No	Out	No	1 h	Jan-05	Alberto Marchionni	Intensity is increased by adding booster turns
7.6.3	Check intensity calibration @ 1E12 ppp	0%	1E12	120	No	Out	No	2 h	Jan-05	Sam Childress	Intensity monitor (MI DCCT, toroids, BPM's, budal monitor?, hadron monitor) linearity are checked with intensities up to 1E12.
7.6.4	Check loss monitor calibration @ 1E12 ppp	0%	1E12	120	Yes	Out	No	2 h	Jan-05	Sam Childress	BLM and TLM calibration is checked using the PM's and calibration target.
7.6.5	Check BPM position calibration (concurrent)	0%	1E12	120	No	Out	No	2 h	Jan-05	Sam Childress	BPM positions are checked against the PM's during LM calibration
7.6.6	Calibrate the baffle	0%	1E12	5	No	LE	No	2 h	Jan-05	Jim Hylen	Scan beam on the baffle and calibrate the thermocouple response. Jim would like higher rep rate to make this go quicker.
7.7	First neutrinos	0%	1E12	60	No	LE	No	1.63 d	Jan-05		First neutrinos
7.7.1	Turn on the horn. Tgt in LE position	0%	1E12	60	No	LE	Yes	1 h	Jan-05	Jim Hylen	Configure beamline and target hall for neutrino production.
7.7.2	Re-define BPS golden file	0%	1E12	60	No	LE	Yes	0 d	Jan-05	Bruce Baller	Require horn and target IN in BPS. Declare new golden file.
7.7.3	Log neutrinos in ND	0%	1E12	60	No	LE	Yes	1 d	Jan-05	Bruce Baller	Stable beam running.
7.7.4	Perform beam-on surveys (concurrent)	0%	1E12	60	No	LE	Yes	4 h	Jan-05	Mike Gerardi	Beam-on rates are measured below-ground in areas that personnel will (hopefully) access while the beam is on.

7.7.5	Check residual rates in the tunnel	0%	0	0	No	LE	Yes	4 h	Jan-05	Mike Gerardi	An access in the MI, NuMI stub, CT and pre-target areas is made to check residual rates on all NuMI components.
7.8	Multi-batch tuning	0%	~1E12	120	No	LE	Yes	7 d	Jan-05		Establish Main Injector multi-batch operation. Check NuMI transport & optics, kicker timing
7.8.1	Check NuMI timing with 2 batches	0%	6E11	120	No	LE	Yes	4 h	Jan-05	Alberto Marchionni	Magnet ramps, BPM position/intensity and LM's are checked. Fast Batch Integrator operation is checked.
7.8.2	Check NuMI timing with 3 batches	0%	9E11	120	No	LE	Yes	4 h	Jan-05	Alberto Marchionni	Magnet ramps, BPM position/intensity and LM's are checked. Fast Batch Integrator operation is checked.
7.8.3	Check NuMI timing with 4 batches	0%	1.2E12	120	No	LE	Yes	4 h	Jan-05	Alberto Marchionni	Magnet ramps, BPM position/intensity and LM's are checked. Fast Batch Integrator operation is checked.
7.8.4	Check NuMI timing with 5 batches	0%	1.5E12	120	No	LE	Yes	4 h	Jan-05	Alberto Marchionni	Magnet ramps, BPM position/intensity and LM's are checked. Fast Batch Integrator operation is checked.
7.8.5	Increase NuMI intensity w 5 batches	0%	2.5e13	120	No	LE	Yes	5 d	Jan-05	Alberto Marchionni	
7.9	Reduce cycle time - Mixed mode	0%	5E12	0	No		No	1 d	Jan-05		Establish standard NuMI cycle time in mixed mode
7.9.1	Test MI "Beam Quality" BPS inputs in mixed mode	0%		0	No		No	1 d	Jan-05	Alberto Marchionni	
8	Main Injector - High Intensity	0%		0	No		No	1 d	Jan-05		
8.1	Upgrade MI loss monitors in NuMI extraction region	0%		0	No		No	1 d	Jan-05	Alberto Marchionni	
9	Turnover to Operations	0%		0	No		No	1.5 d	Jan-05		
9.1	Document tunes/settings, etc	0%		0	No		No	1 d	Jan-05	Sam Childress	
9.2	Document training for future operators	0%		0	No		No	0.5 d	Jan-05	Sam Childress,Alberto Marchionni	